A revision of the Suctoria (Ciliophora, Kinetofragminophora) 3. *Tokophrya* and its morphological relatives

Colin R Curds
Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD

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Introduction

The first two parts of this series (Curds, 1985*a* & *b*) dealt with *Acineta* and its relatives which are all stalked forms that possess a lorica and reproduce asexually by circum-invaginative endogenous budding. The genera included here similarly reproduce by endogenous budding but none possess a lorica, some are stalked while others attach or anchor themselves to the substrate by a body projection. The major genus included here is *Tokophyra* Butschli, 1889 a well known freshwater genus that contains a large number of nominal species. Many of these have been transferred to other genera but until recently not even a check list of those which remained was available, thus making it difficult for the taxonomist and ecologist to identify them. A brief account of the structures and modes of reproduction important in taxonomy was given in Curds (1985a) and will not be repeated here as the genera included in both parts are related.

Genus ***TOKOPHRYA*** Butschli, 1889

Butschli (1889) erected the genus *Tokophrya* for a wide variety of suctorians since his diagnosis included all those species which had a stalk, reproduced endogenously and were without a lorica. He divided the genus into three subgenera, including *Discophrya* and two other unnamed subgeneric groups, because of the variety of form included in the diagnosis. Collin (1912) merged the first two of these subgeneric groups into the genus *Discophyra* Lachmann, 1859 which clearly had priority and emended the diagnosis of *Tokophrya* to include only those species with a pyriform or pyramidal body shape and tentacles in 1 to 4 fascicles on the apical surface. With the one exception of *Tokophrya flexilis* Kellicott, 1887, all 8 species included by Collin (1912) were retained by Matthes & Rebhan (1983) in their recent check list of 19 species. The species included here agree, to a large extent, with those in the previously mentioned list although there are some differences that should be noted. The two loricate species *Acineta tripharetrata* and *Tokophrya muscicola* have been transferred to *Phyllacineta tripharetrata* Curds, 1985*a* and *Rondacineta muscicola* Jankowski, 1978 respectively. The stalkless *Tokophrya bathynellae* Chappuis, 1944 is transferred to *Brachyosoma bathynellae* later in this publication. Additionally 5 other species of *Tokophrya* omitted by Matthes & Rebhan (1983) and one doubtful species have been included here. Jankowski (1981) suggested the transfer of several of Swarczewsky's (1928) *Acineta* species into

Tokophrya but these changes were not accepted by Curds (1985*b*) and are therefore omitted from this publication.

Diagnosis of *Tokophrya*

Suctorians whose outline may be oval, pyriform or triangular, not usually flattened laterally and only weaker so when they are. All species so far reported are freshwater. Lorica absent. Attached to invertebrates, aquatic plants or inanimate objects by means of a stalk. Tentacles arranged in 1 to 4 fascicles, usually situated on the apical surface. Actinophores, if present, simple rounded lobes and not ring-like. Reproduction by circum-invaginative endogenous budding resulting in ovoid larvae bearing 4 or 5 transverse ciliary rings. Macronucleus spherical to elongate.

Key to the species of *Tokophrya*

1.	Tentacles in one or two fascicles	6
	Tentacles in more than two fascicles	2
2.	All tentacles at apical end of body	3
	Most tentacles at apex but one fascicle at posterior end of body	*T. fasciculatum*
3.	Tentacles in four fascicles on actinophores	5
	Tentacles in three fascicles not on actinophores	4
4.	Not epizooic, tentacles capitate, two contractile vacuoles	*T. pyrum*
	Epizooic, tentacles not capitate, one contractile vacuole	*T. diaptomi*
5.	Actinophores in centre of apical region surrounded by rim	*T. emarginata*
	Actinophores at corners of apical region, not surrounded by rim	*T. quadripartita*
6.	Tentacles in single fascicle	7
	Tentacles in two fascicles	10
7.	Single contractile vacuole, found on peritrichs	8
	Two contractile vacuoles, found on arthropods	*T. manueli*
8.	Tentacles long, stalk thin	9
	Tentacles short but many, stalk thick	*T. pygmaea*
9.	Ovoid body, many tentacles, stalk as long as body	*T. okobojiensis*
	Pyriform or irregular body, few tentacles, stalk half body length	*T. carchesii*
10.	Gregarious, grows in colonial groups	*T. glomerata*
	Solitary	11
11.	Junction of stalk with body simple (Fig. 1a)	14
	Junction of stalk with body complex (Fig. 1b–d)	12

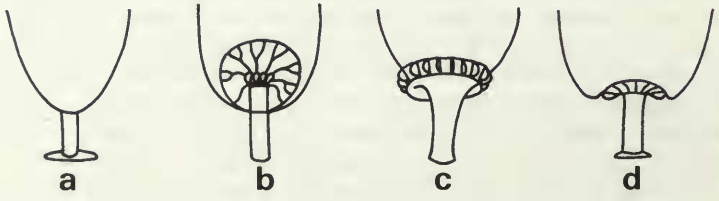

Fig. 1 Various junctions between stalk and body found in *Tokophrya*.

12.	Apical body region with circular rim	*T. wenzeli*
	Apical body region without circular rim	13
13.	Stalk joins body inside a pocket, single contractile vacuole	*T. actinostyla*
	Stalk joins body via external frilled collar, two contractile vacuoles	*T. ornata*
14.	Epizooic on crustacea or molluscs	18
	Not epizooic	15
15.	One contractile vacuole posterior, one anterior	*T. infusionum*
	All contractile vacuole lie in anterior	16

16. Body elongate, with one or two contractile vacuoles situated laterally . . ***T. lemnarum***
    Body rounded, with single contractile vacuole centrally located at apex 17
17. Stalk thin, body small, found in sphagnum moss . . . . . ***T. gracilipes***
    Stalk wide, body medium, found in foul water . . . . . ***T. bengalensis***
18. Body rounded . . . . . ***T. stammeri***
    Body conical to pyramidal 19
19. Apical region strongly convex, two contractile vacuoles, situated laterally . . . ***T. grisea***
    Apical region concave or slightly rounded, single, usually centrally located, contractile vacuole . 20
20. Apical region strongly concave, actinophores well developed . . . . ***T. phreaticum***
    Apical region rounded or convex, actinophores present but not well developed . ***T. cyclopum***

Species descriptions

Tokophrya quadripartita (Claparède & Lachmann, 1859) Butschli, 1889

Podophrya quadripartita Claparède & Lachmann, 1859
Acineta quadripartita Stein, 1859
Podophyra cyclopum Claparède & Lachmann, 1861 *pro parte*
Acineta quadriloba Stein, 1867
Megatricha partita Badcock, 1880
Tokophryopsis (*Epitokophrya*) *quadripartita* Jankowski, 1978

DESCRIPTION (Fig. 2). This, the type, is a medium to large, (60–140 μm long), freshwater species whose body shape is pyramidal and approximately square in cross section. There are 4 lobe-like prominent actinophores, one at each corner of the apical surface, each bearing a fascicle of capitate tentacles. Lorica absent. Stalk of variable length present. Attached to a variety of substrata including animals such as peritrich stalks (*Epistylis plicatilis*), mollusc shells (*Paludina* sp.), crustacea (*Cyclops*), turtle shells (*Chrysemys picta belli*), a variety of aquatic plants, to organic debris such as activated sludge and to inanimate objects. Number of contractile vacuoles varies from 1 to 3. Macronucleus spherical to ovoid, centrally placed. Endogenous budding results in an ovoid larval form with variable numbers of ciliary rows and formations. Both Collin (1912) and Kormos and Kormos (1958) clearly illustrate (see Fig. 2f, g, i, j) 5 rings of cilia while the more modern silver-line preparations of Guilcher (1951) have shown (Fig. 2d,e) that there are 4 double transverse rows of cilia encircling the body with a single short posterior row. It is not yet quite clear whether or not the ciliation is variable or if the earlier reports reflect the difficulties of examining ciliary rows without the use of staining procedures.

NOTE. Jankowski (1978) was of the opinion that this species should form a subgenus *Epitokophrya* of the genus *Tokophryopsis* Swarczewsky, 1928 with the major character of having 4 actinophores. However, the major distinguishing characteristic of *Tokophryopsis* is not just the presence of three actinophores but more importantly their ring or crown-like shape. No suctorian described to date, other than *Tokophryopsis gigantea,* has actinophores of that form and for this reason should be kept distinct until further evidence based on other characters suggests otherwise. Butschli (1889) did not designate a type when he erected the genus but it was one of his original nominal species. Sand (1899) did not indicate types in any way but Collin (1912) listed the species in other of the date of the original description and here this has been interpreted to indicate that the first mentioned is the type. Furthermore it is a commonly occurring species that has been figured and described on several occasions.

Tokophrya actinostyla (Collin, 1912) Penard, 1920

Tokophrya cyclopum var. *actinostyla* Collin, 1912

DESCRIPTION (Fig. 3). Medium to large (87–120 μm long), freshwater suctorian whose body shape is approximately cylindrical. There are 2 fascicles of capitate tentacles, one on either side of the apical surface. Lorica and actinophores absent. Attached to crustacea such as *Cyclops* by a wide short stalk that is about a quarter of the body length. Junction between stalk and suctorian a

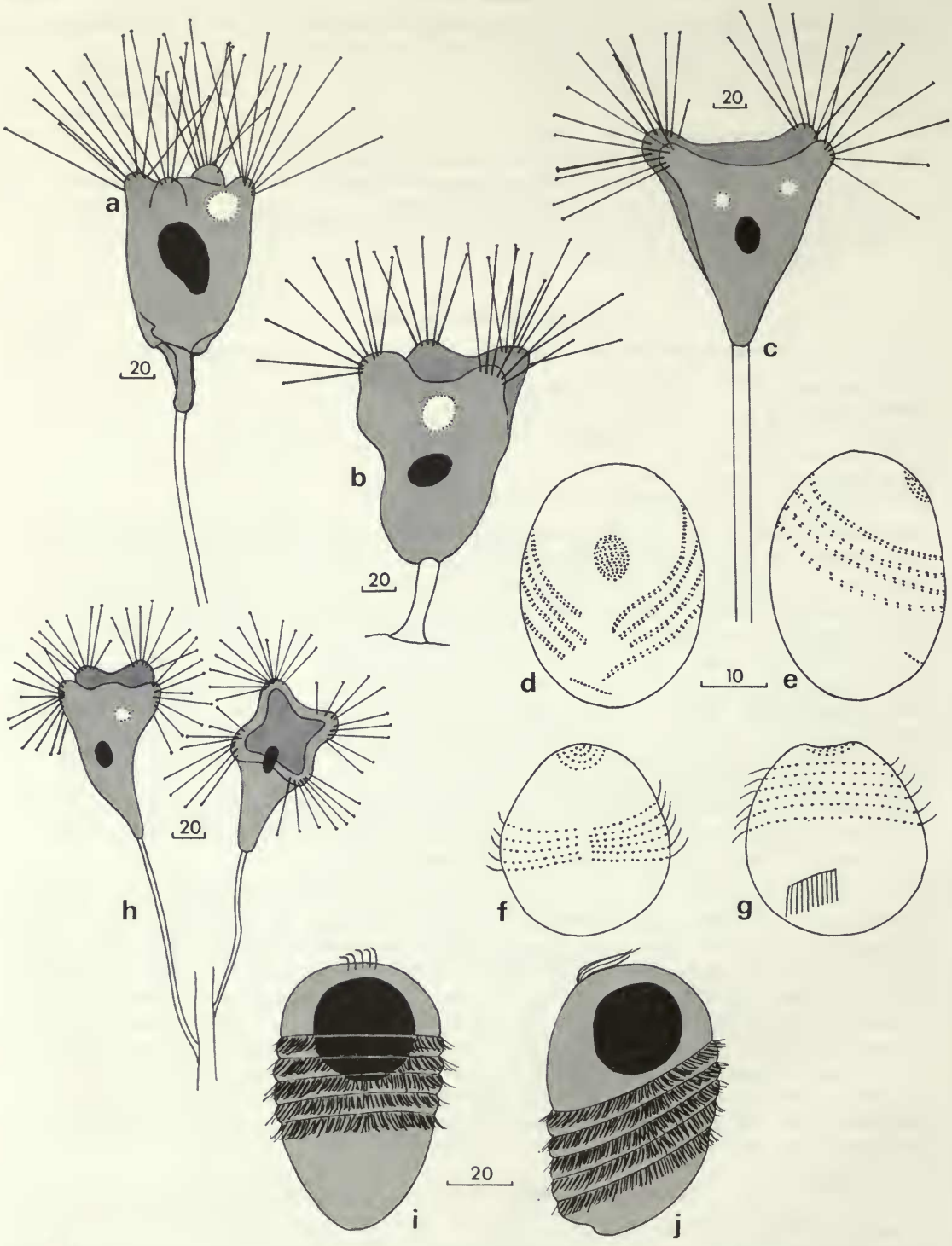

Fig. 2 *Tokophrya quadripartita*: (a) after Goodrich & Jahn, 1943; (b) after Claparède & Lachmann, 1861 (called *Podophrya quadripartita*); (c) after Holm, 1925; (d,e) embryos after Guilcher, 1951; (f,g) embryos after Kormos & Kormos, 1958; (h) after Kent, 1882 (called *Podophrya quadripartita*); (i,j) embryos after Collin, 1912.

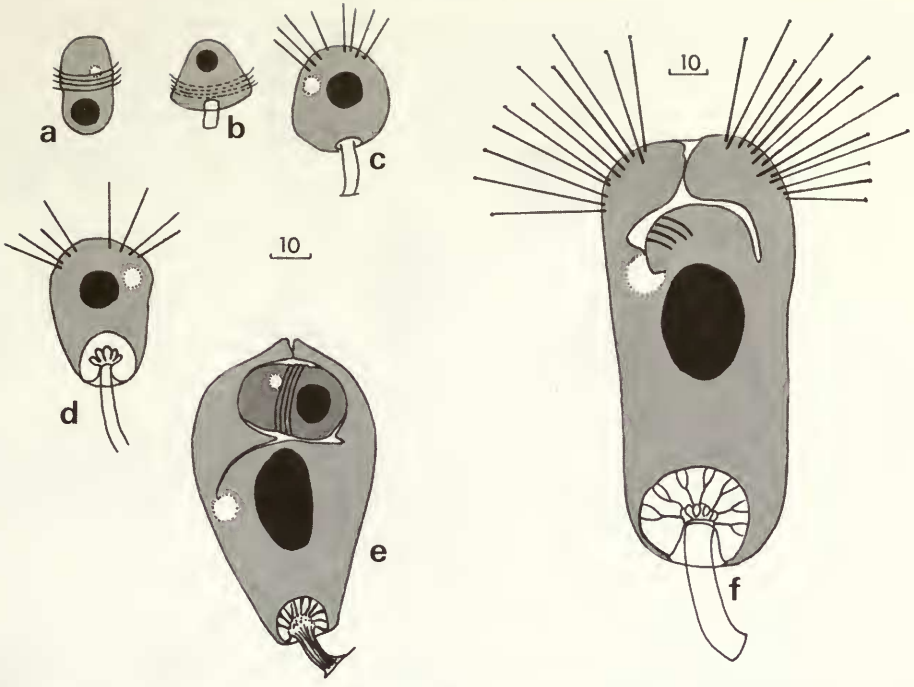

Fig. 3 *Tokophrya actinostyla*: (a–e) stages of development from bud to adult, after Collin, 1912; (f) after Penard, 1920.

prominent spherical capsule enclosed within posterior region of body. Capsule contains many rods radiating from the stalk end to its periphery (Fig. 3e,f). Single contractile vacuole situated anterio-laterally. Centrally located spherical to ovoid macronucleus. Ovoid endogenous buds with 4 or 5 ciliary rings encircling mid-region of bud.

Tokophrya bengalensis Ghosh, 1929

Tokophrya apartita Fukui & Morishita, 1962
Tokophrya conica Fukui & Morishita, 1962
Tokophrya longistyla Fukui & Morishita, 1962
Tokophrya magna Fukui & Morishita, 1962
Tokophrya oligotentaculata Fukui & Morishita, 1962
Tokophrya oviforme Fukui & Morishita, 1962
Tokophrya rotunda Fukui & Morishita, 1962

DESCRIPTION (Fig. 4). Small to medium (30–80 μm long), freshwater species whose body shape varies from roundly conical to ovoid or spherical. There are 2 apical fascicles of capitate tentacles, actinophores either absent or reduced. Lorica absent. Attached by a long stalk to bacterial growths and inanimate objects associated with aerobic sewage-treatment processes. Single contractile vacuole anteriorly located. Macronucleus irregularly ovoid to pyramidal. Budding not described.

Tokophrya carchesii (Claparède & Lachmann, 1859) Butschli, 1889

Podophrya carchesii Claparède & Lachmann, 1859
Tokophryella carchesii Jankowski, 1973

DESCRIPTION (Fig. 5). Small (25–50 μm long), freshwater suctorian whose body varies from pyriform or spherical to irregularly ovoid. Body commonly held at right angles to stalk. Attached to the stalks of peritrichous ciliates such as *Carchesium polypinum, C. aselli, Campanella*

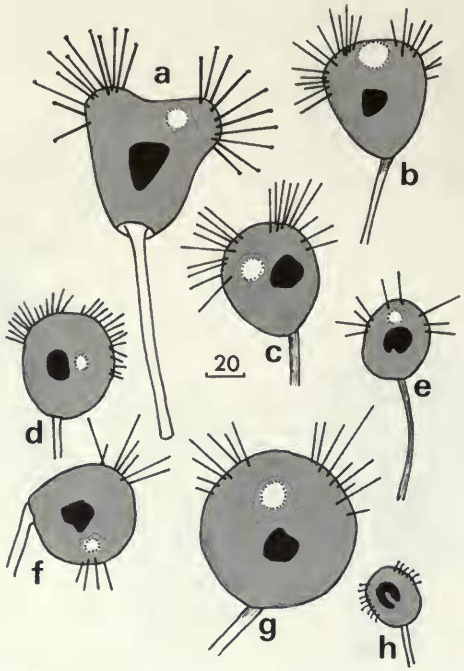

Fig. 4 *Tokophrya bengalensis*: (a) after Ghosh, 1929; (b–h) after Fukui & Morishita, 1962 (called *T. conica, T. oviforme, T. magna, T. apartita, T. oligotentaculata, T. rotunda* and *T. longistyla* respectively).

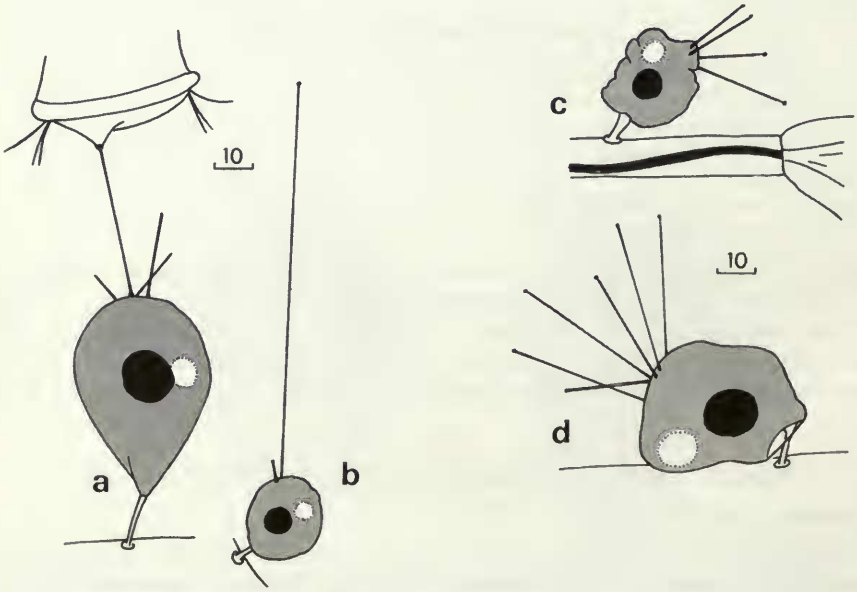

Fig. 5 *Tokophrya carchesii*: (a–d) after Matthes, 1971.

umbellaria and *Epistylis flavicans* upon which the suctorian feeds. Stalk usually less than half the body length. Single fascicle of capitate tentacles of highly variable length. Lorica and actinophores absent. Reproduction by endogenous budding. Macronucleus spherical, single contractile vacuole present.

NOTE. Jankowski (1973) erected the genus *Tokophryella* with this species as the type, however the move was ignored by more recent workers (Matthes and Rebhan, 1983).

Tokophrya cyclopum (Claparède & Lachmann, 1859) Butschli, 1889

Podophrya cyclopum Claparède & Lachmann, 1859
Acineta cyclopum Stein, 1859

DESCRIPTION (Fig. 6). Small to medium (25–80 μm long), freshwater suctorian whose body shape varies from pyriform to pyramidal. Actinophores, if present, rarely prominent. Capitate tentacles in 2 fascicles. Lorica absent. Attached to crustacea such as *Cyclops*. *Gammarus* and *Epischura,* also attached to aquatic plants such as *Lemna* and *Vallisneria* often in the presence of the peritrich *Epistylis anastatica*. Stalk short, usually less than length of the body and frequently longitudinally striated. Reproduction by formation of endogenous buds which bear 4 transverse

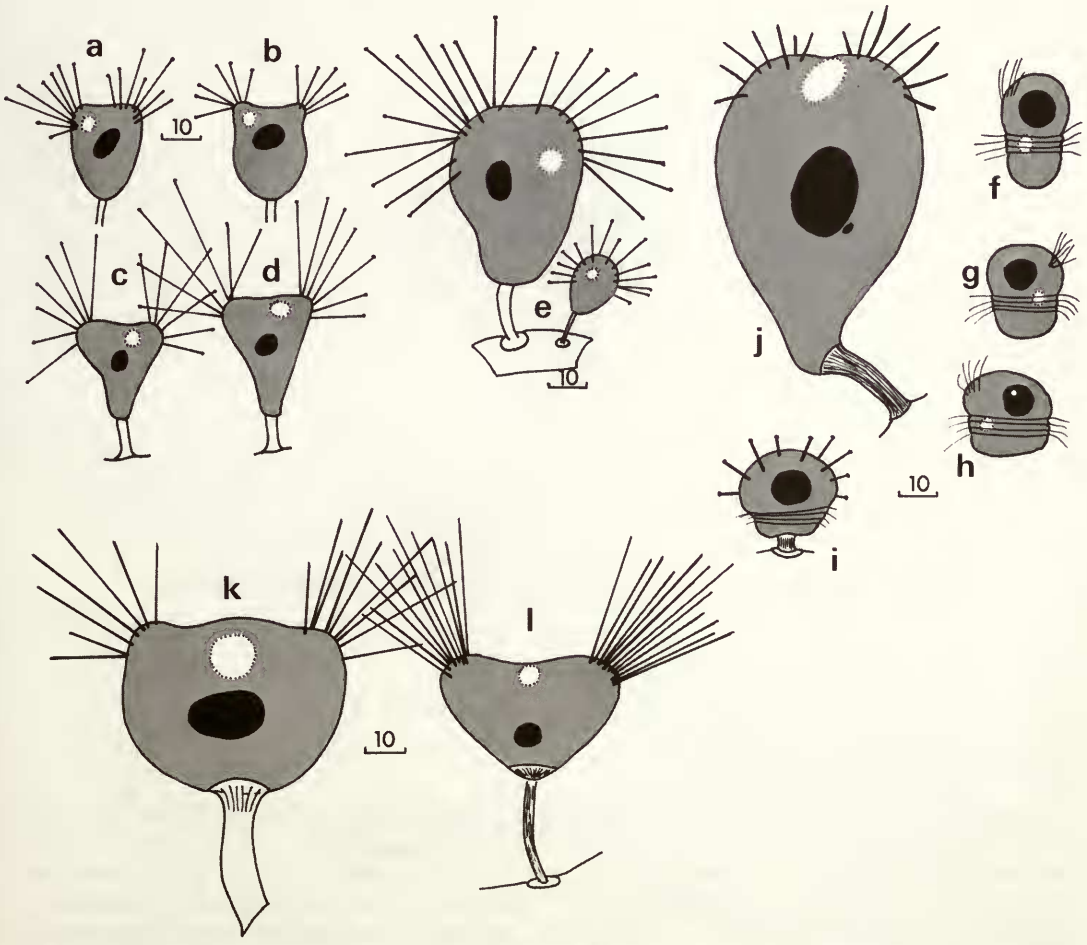

Fig. 6 *Tokophrya cyclopum*: (a,b) after Schewiakoff, 1893 (called *Podophrya cyclopum*); (c,d) after Wailes, 1928; (e) after Kent, 1882 (called *Podophrya cyclopum*); (f–j) stages in development from embryo to adult, after Collin, 1912; (k) after Penard, 1920; (l) after Gajewskaja, 1933.

girdles of cilia. Macronucleus ovoid to spherical, centrally located. Contractile vacuole in anterior body half.

Tokophrya diaptomi (Kellicott, 1885) Sand, 1900

Podophrya diaptomi Kellicott, 1885
Tokophrya diaptami Sand, 1901
Trinacineta diaptomi Jankowski, 1981

DESCRIPTION (Fig. 7). Medium (65 μm long), freshwater species whose pyriform body is elongate and plastic. Numerous tentacles present, not distinctly capitate, arranged in 3 fascicles on the apical body surface. Actinophores and lorica absent. Stalk length varies between half and total body length, is slightly curved and striated. Attached to the freshwater crustacean *Diaptomus*. Budding not described. Contractile vacuole situated apically, spherical macronucleus located centrally.

NOTE. Jankowski (1981) erected the genus *Trinacineta* with this species as the type. The presence of three fascicles is not regarded sufficient reason to erect a new genus.

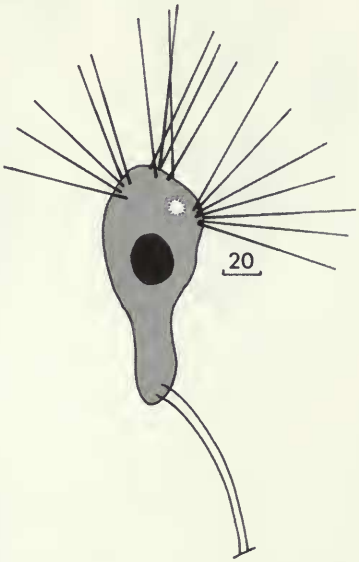

Fig. 7 *Tokophrya diaptomi*, after Kellicott, 1885 (called *Podophrya diaptomi*).

Tokophrya emarginata Swarczewsky, 1928

Tokophrya radiata Gajewskaja, 1933
Tokophryopsis emarginata Jankowski, 1981

DESCRIPTION (Fig. 8). Medium to large (60–150 μm long), freshwater suctorian whose body is distinctly pyramidal in shape. Number of prominent actinophores present, usually 4 but sometimes only 1 or 2. Actinophores situated on the apical surface surrounded by a rim of cytoplasm. Number of fascicles similarly vary from 1 to 4, tentacles not distinctly capitate. Lorica absent. Stalk varies in length, from 50 to 400 μm long, equipped with large basal disc. Attached to crustacean *Odonthogammarus improvisus* in Lake Baikal. Reproduction by endogenous budding. Central spherical macronucleus. Contractile vacuole usually in apical position between the actinophores.

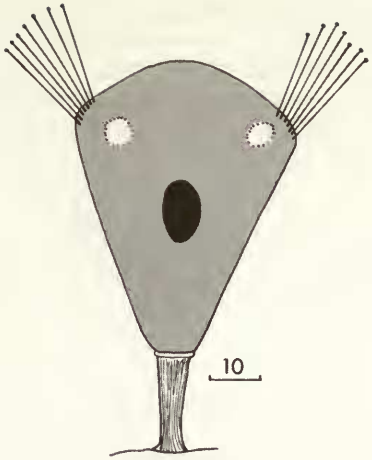

Fig. 8 *Tokophrya emarginata*: (a–c) after Gajewskaja, 1933 (called *Tokophrya radiata*); (d) after Swarczewsky, 1928.

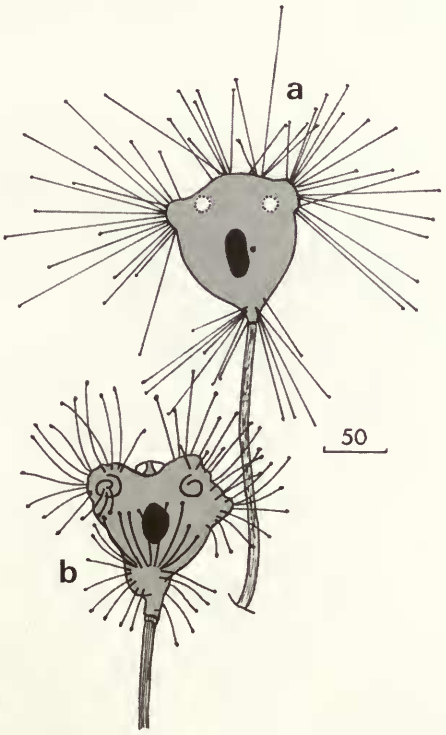

Fig. 9 *Tokophrya fasciculata*: (a) after López-Ochoterena, 1964 (called *Hypophrya fasciculata*); (b) after Entz, 1902 (called *Tokophrya cyclopum*).

Tokophrya fasciculata (López-Ochoterena, 1964) Matthes & Rebhan, 1983

Tokophrya cyclopum Entz, 1902 *pro parte*
Tokophrya cyclopum var. *patagonica* Collin, 1912
Hypophrya fasciculata López-Ochoterena, 1964
Trinacineta patagonica Jankowski, 1981.

DESCRIPTIONS (Fig. 9). Medium to large (96–126 μm long), freshwater suctorian whose body shape is pyramidal. There are 2 lobe-like actinophores but 4 fascicles of capitate tentacles, 3 fascicles are situated on the apical surface but the other is in the posterior region with the tentacles clustered around the stalk. Lorica absent. Attached to the shells of the mollusc *Limnaea attenuata* Say and *Physa osculans* Aldeman by a striated stalk that is at least twice the length of the body. There are two anterior contractile vacuoles, one either side of the body. Central macronucleus ovoid. Reproduction by endogenous budding.

NOTE. López-Ochoterena (1964) erected the genus *Hypophrya* with this as the type species, however recent authorities (Matthes & Rebhan, 1983) do not consider it to be sufficiently distinct to warrant separation from *Tokophrya*. It should be noted that the first record of this organism was that of Entz (1902) who considered it to be a variant of *Tokophrya cyclopum*.

Tokophrya glomerata Penard, 1920

DESCRIPTION (Fig. 10). Small (20 μm long), gregarious, freshwater species which form pseudocolonies of ten to twenty individuals. Each zooid is pyriform in shape and the colony is roughly hemispherical. Stalk short, attached to central mucilaginous mass. Colony floats freely in water. Actinophores greatly reduced or absent. Capitate tentacles in 2 fascicles. Lorica absent. Central macronucleus spherical. Single contractile vacuole located behind nucleus in anterior body third. Conjugation but not asexual reproduction has been described.

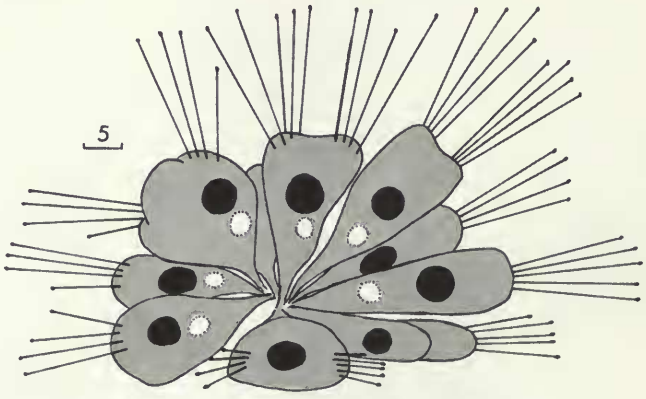

Fig. 10 *Tokophrya glomerata*, after Penard, 1920.

Tokophrya gracilipes Penard, 1920

DESCRIPTION (Fig. 11). Small (30 μm long), freshwater suctorian whose shape is ovoid to pyriform, oval in cross-section. Actinophores and lorica absent. Capitate tentacles arranged in 2 anterio-lateral fascicles. Stalk, which is just longer than the body, widens posteriorly to join a prominent basal plate. Found in sphagnum moss. Central spherical macronucleus, single apical contractile vacuole. Reproduction by endogenous budding.

Tokophrya grisea Gajewskaja, 1933

DESCRIPTION (Fig. 12). Medium (60 μm long), freshwater species whose shape is pyriform with a strongly convex apical surface. Actinophores and lorica absent. Capitate tentacles arranged in 2 anterio-lateral fascicles. Stalk less than length of body, striated and joins body via a narrow, unstriated band. Attached to gammarid crustacea in Lake Baikal. Two anterio-lateral contractile vacuoles present. Macronucleus ovoid and centrally located. Budding not described.

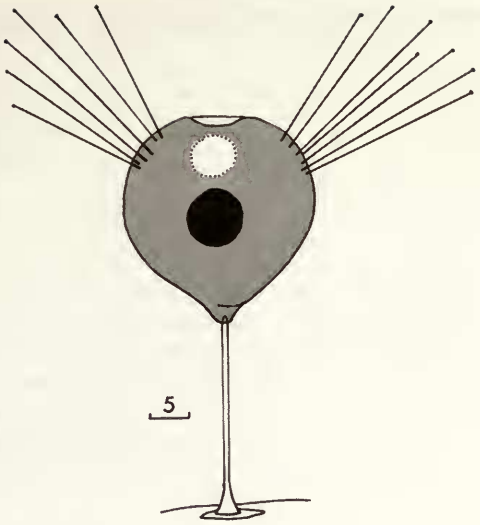

Fig. 11 *Tokophrya gracilipes*, after Penard, 1920.

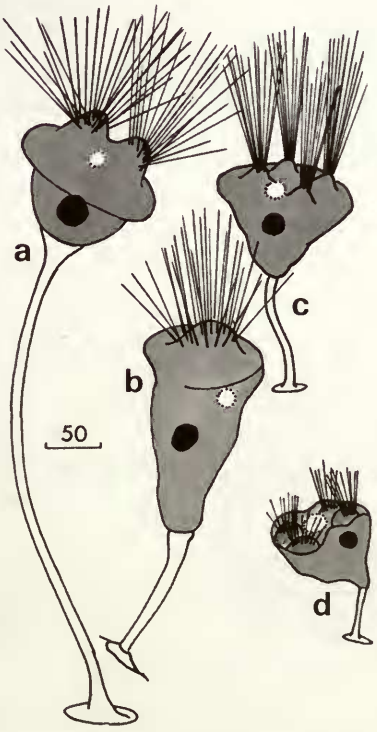

Fig. 12 *Tokophrya grisea* after Gajewskaja, 1933.

Tokophrya infusionum (Stein, 1859) Butschli, 1889

Podophrya fixa Stein, 1854 *pro parte*
Actinophrys sol Stein, 1854 *pro parte*
Acineta infusionum Stein, 1859
Podophrya infusionum Engelmann, 1862
Acineta gelatinosa Buck, 1884 *non* Swarczewsky, 1908
Podophrya fixa Dangeard, 1890
Trichophrya angulata Dangeard, 1890

DESCRIPTION (Fig. 13). Medium (60–80 μm long), freshwater suctorian whose body shape is pyramidal. Actinophores and lorica absent. Capitate tentacles arranged in 2 anterio-lateral fascicles. Stalk short, usually only 5–10 μm long with prominent basal disc, attached to inanimate objects in pond water and infusions. Two contractile vacuoles present, one each in anterior and posterior body halves. Central spherical macronucleus. Reproduction by endogenous budding producing a bud with 4 or 5 ciliary girdles. Most reports indicate the presence of 5 bands of cilia, but Guilcher (1951) illustrated the presence of 4 double bands and a short posterior ciliary row although she too illustrated an example with 5 bands.

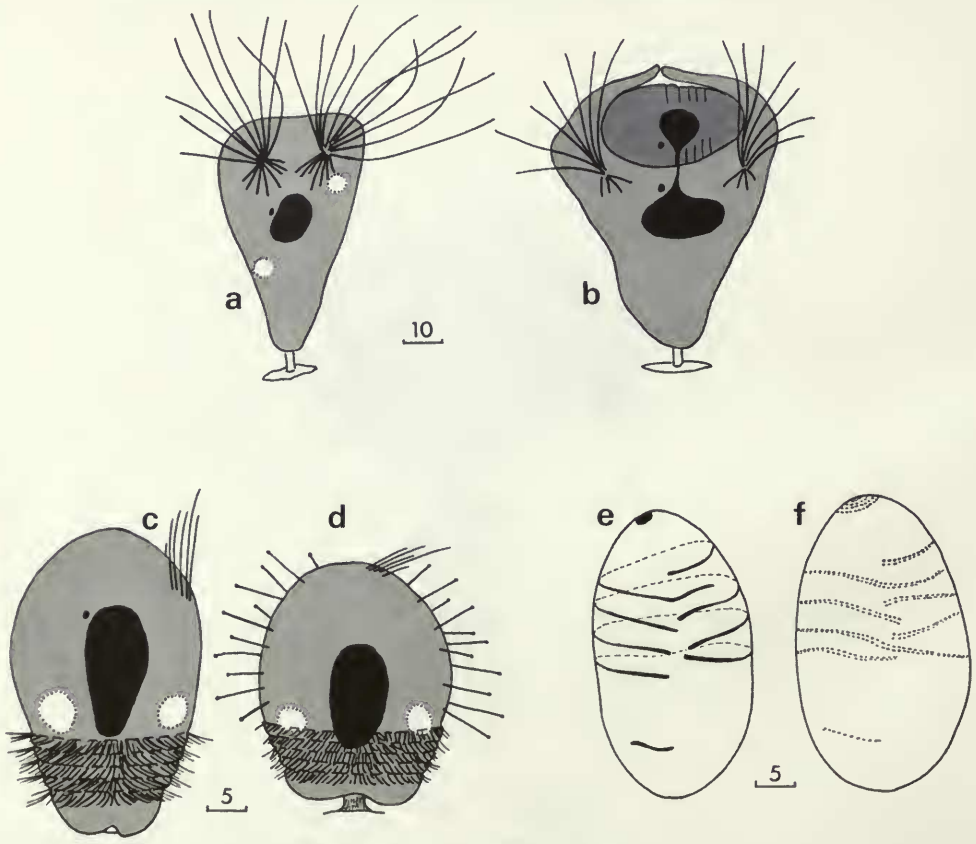

Fig. 13 *Tokophrya infusionum*: (a–d) various stages in development, after Collin, 1912; (e,f) embryos after Guilcher, 1951.

Tokophrya lemnarum (Stein, 1859) Entz, 1902

Acineta lemnarum Stein, 1859
Acineta phryganidarum Stein, 1859
Podophrya mollis Kent, 1882
Podophrya phryganidarum Kent, 1882
Tokophrya cyclopum Sand, 1901 *pro parte*

DESCRIPTION (Fig. 14). Small to medium (40–100 μm long), freshwater species whose body shape is pyriform to pyramidal. Lorica absent. Fascicles of capitate tentacles mounted on 2 actinophores. Stalk striated, of variable length but usually at least as long as body, attached to aquatic plants including *Lemna*. There are usually 2 anterio-lateral contractile vacuoles. Macronucleus ovoid to elongate with several micronuclei. Reproduction by endogenous budding producing buds with 4 ciliary girdles. Conjugation has been reported (Collin, 1912; Kent, 1980–82).

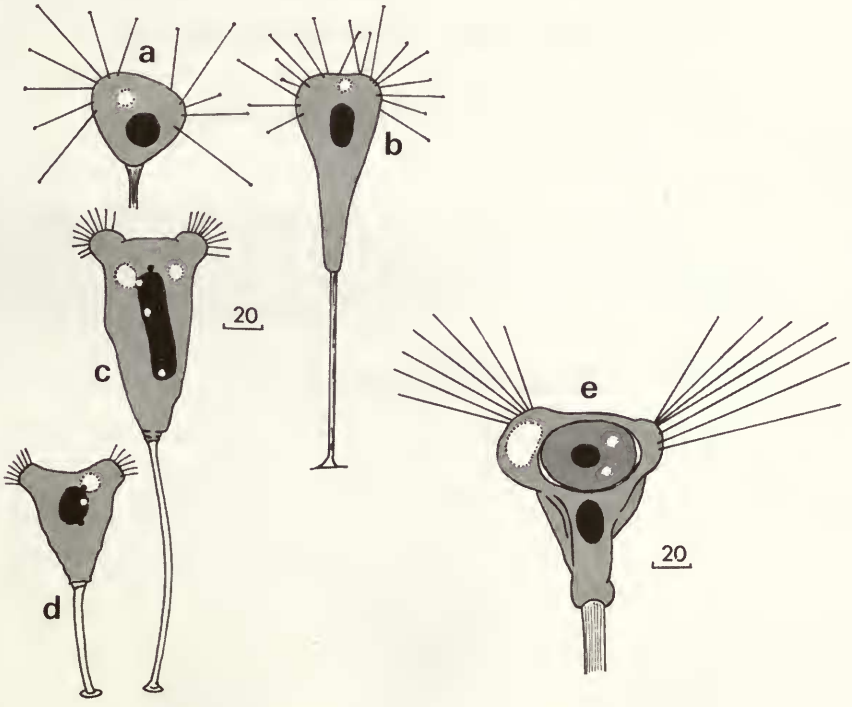

Fig. 14 *Tokophrya lemnarum*: (a,b) after Collin, 1912; (c,d) after Entz, 1902; (e) after Penard, 1920.

Tokophrya manueli Matthes & Rebhan, 1983

DESCRIPTION (Fig. 15). Small (20–55 μm long), freshwater suctorian whose body shape is ovoid. Actinophores and lorica absent. Capitate tentacles in single fascicle distributed over apical surface. Stalk length variable, at least the length of the body but often 2–3 times its length. Junction of stalk with body with scalloped edge. Attached to algae and to the hydrocaulus of *Cordylophora caspia*. There are 3 contractile vacuoles and a centrally located ovoid macronucleus. Reproduction by endogenous bud formation.

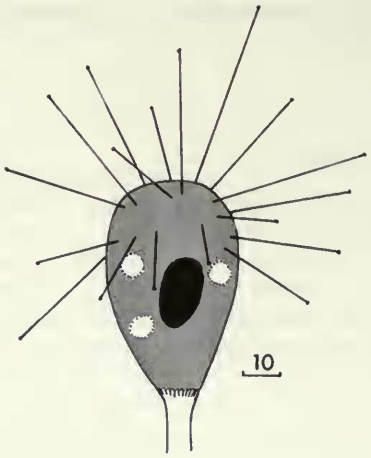

Fig. 15 *Tokophrya manueli*, after Matthes & Rebhan, 1983.

Tokophrya okobojiensis (Goodrich & Jahn, 1943) n. comb.

Podophrya okobojiensis Goodrich & Jahn, 1943
Tokophryella okobojiensis Jankowski, 1981

DESCRIPTION (Fig. 16). Small (35 μm long), ovoid freshwater species. Actinophores and lorica absent. Single anterior fascicle of many capitate tentacles that are at least the length of the body. Stalk about the same length as body, attached to stalks of peritrichs on freshwater turtles. Macronucleus spherical, centrally located with an adjacent contractile vacuole. Mode of reproduction undescribed.

NOTE. Appears to be related to *T. carchesii* and *T. pygmaea*.

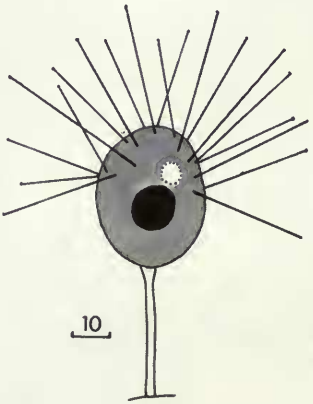

Fig. 16 *Tokophrya okobojiensis*, after Goodrich & Jahn, 1943 (called *Podophrya okobojiensis*).

Tokophrya ornata Gajewskaja, 1933

Basitokophrya Jankowski, 1982

DESCRIPTION (Fig. 17). Small (30–35 μm long), freshwater suctorian whose body shape is approximately ovoid. Actinophores and lorica absent. Two fascicles of tentacles, which have

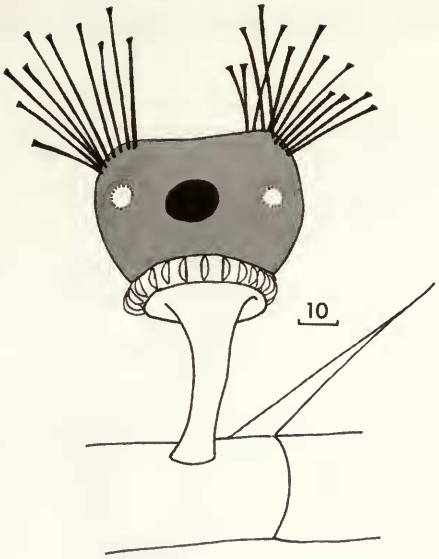

Fig. 17 *Tokophrya ornata,* after Gajewskaja, 1933.

expanded, trumpet-shaped ends, are situated on the anterio-lateral edges of the body. Stalk stout, about same length as body. Junction of stalk with body in form of a prominent frilled collar-like disc. Attached to gammarid crustacea in Lake Baikal. There are 2 contractile vacuoles situated laterally, halfway down the body. Macroneucleus spherical, located centrally. Reproduction not described.

Tokophrya phreaticum Uéno, 1962

DESCRIPTION (Fig. 18). Small (25 μm long), freshwater species whose body is pyramidal. Lorica absent. Two prominent actinophores each with a fascicle of capitate tentacles. Stalk short, usually only 2–4 μm long, attached to the crustacean *Bathynella inlandica* Uéno found in a Japanese well. Single large apical contractile vacuole present, located just in front of central, spherical macronucleus. Reproduction not described.

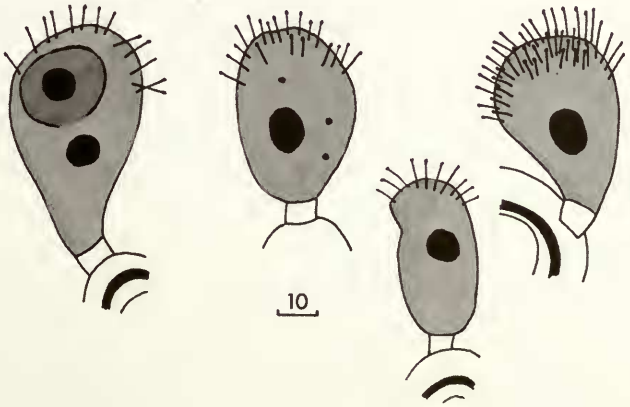

Fig. 18 *Tokophrya phreaticum.* After Uéno, 1962.

Tokophrya pygmaea (Swarczewsky, 1928) n. comb.

Discophrya pygmaea Swarczewsky, 1928
Riftus pygmaea Jankowski, 1981

DESCRIPTION (Fig. 19) Small (50–55 μm long), freshwater suctorian whose body shape is pyriform. Actinophores and lorica absent. Single fascicle of many, short capitate tentacles borne on the apical surface. Attached to the stalks of colonial peritrichs such as *Zoothamnium* sp. by a short but stout stalk. Reproduction by endogenous budding. Macronucleus centrally located.

NOTE. Originally described as a species of *Discophrya* a genus that reproduces by evaginative budding and usually has a lorica. It would appear to be related to *Tokophrya carchesii*.

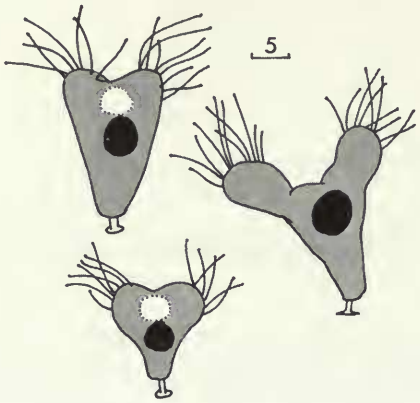

Fig. 19 *Tokophrya pygmaea*, after Swarczewsky, 1928 (called *Discophrya pygmaea*).

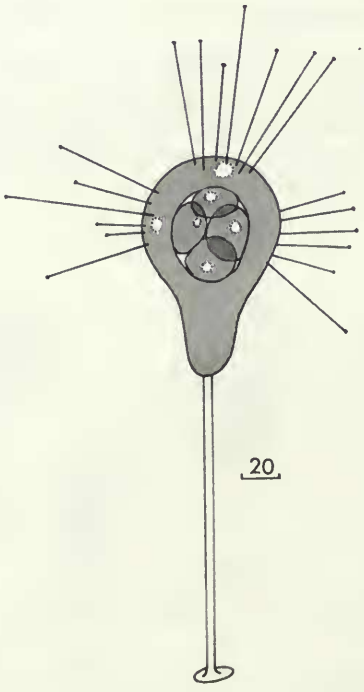

Fig. 20 *Tokophrya pyrum*, after Claparède & Lachmann, 1859 (called *Podophrya pyrum*).

Tokophrya pyrum (Claparède & Lachmann, 1859) Butschli, 1889

Podophrya pyrum Claparède & Lachmann, 1859

DESCRIPTION (Fig. 20). Large (120–170 μm long), freshwater species which is pyriform in shape. Actinophores and lorica absent. There are 3 fascicles of capitate tentacles, 1 on the apex and 2 lateral bundles. Stalk long, usually about double the body length. Attached to aquatic plants including *Lemna trisulca*. There are 2 contractile vacuoles, one apically situated the other is lateral. Spherical macronucleus centrally located. Reproduction by multiple endogenous bud formation.

Tokophrya stammeri Strouhal, 1939

DESCRIPTION (Fig. 21). Small (20 μm long), freshwater suctorian with an ovoid body. Actinophores and lorica absent. There are 2 fascicles of tentacles situated apically. Stalk almost the length of body, attached to the amphipod *Niphargus strouhali*. Single apical contractile vacuole. Spherical macronucleus located in centre of body. Reproduction not described.

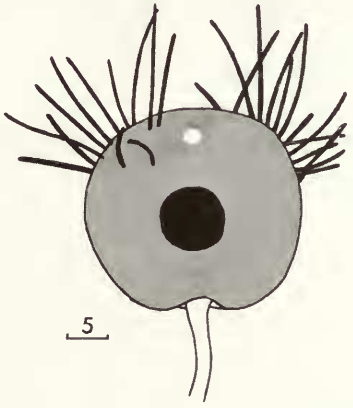

Fig. 21 *Tokophrya stammeri*, after Strouhal, 1939.

Tokophrya wenzeli Matthes & Stiebler, 1970

DESCRIPTION (Fig. 22). Small (22–55 μm long), freshwater suctorian that is pyramidal in shape. Two actinophores present, located on the apical surface and surrounded by a cytoplasmic ridge. Two fascicles of tentacles present. Stalk striated, short, usually about half the body length, joins body via a striated, prominent disc. Attached to water mites such as *Limnesia undulata, L. maculata, Piona conglobata, P. variabilis, Arrhenurus globata* and *A. stecki*. Single apical contractile vacuole. Central ovoid macronucleus. Reproduction by endogenous budding.

Species dubium

Tokophrya sp Guilcher, 1951

DESCRIPTION (Fig. 23). Adult undescribed other than it attaches itself to the shed skin of the newt *Triturus vulgaris*. Bud described with 5 girdles of cilia.

NOTE. A description of the adult is necessary before the position of this organism can be assessed.

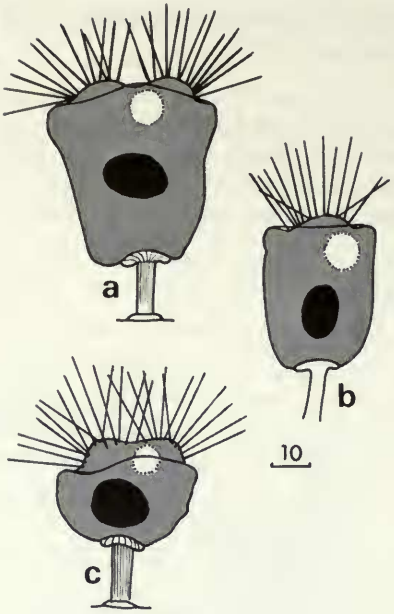

Fig. 22 *Tokophrya wenzeli*, after Matthes & Stiebler, 1970, (a,b) front aspect; (c) side view.

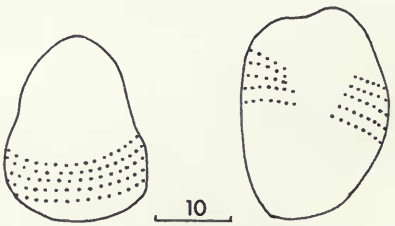

Fig. 23 *Tokophrya* sp., after Guilcher, 1951.

Genus ***TOKOPHRYOPSIS*** Swarczewsky, 1928

Single species genus.

Diagnosis of *Tokophryopsis*

Freshwater suctoria whose shape is pyramidal, rounded in cross-section. Lorica absent. Attached to crustacea by means of a stalk. Tentacles arranged in 3 fascicles, each arising from the centres of 3 crown or ring-like actinophores on the apical surface. Mode of reproduction undescribed. Macronucleus elongate.

Key to species of *Tokophryopsis*

Attached to gammarids in Lake Baikal . . . . . ***T. gigantea***

Species description

Tokophryopsis gigantea Swarczewsky, 1928

DESCRIPTION (Fig. 24). This the type species by monotypy is a large (150–160 μm long), freshwater suctorian whose body shape is distinctly pyramidal. There are 3 crown or ring-like actinophores on the apical surface from within which the tentacles emerge. Lorica absent. Stalk about same length as body, attached to the gammarid crustacean *Poeckilogammarus sukaczewi* in Lake Baikal. Macronucleus elongate. Reproduction not described.

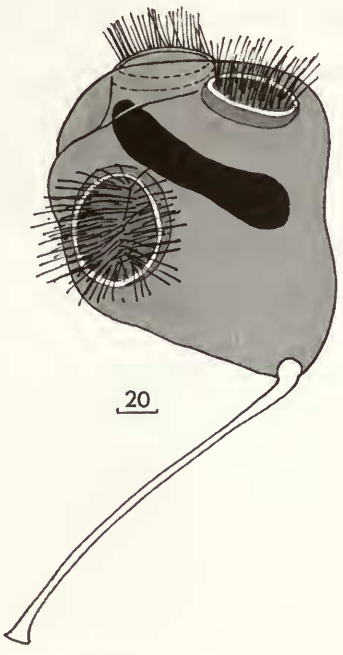

Fig. 24 *Tokophryopsis gigantea,* after Swarczewsky, 1928.

Genus *BRACHYOSOMA* Batisse, 1975

The genus *Hallezia* Sand, 1895 was erected to include those suctoria which, although without lorica and stalk, were nevertheless attached to the substratum via a simple adhesive projection that was not differentiated from the rest of the body. Tentacles were either in fascicles or distributed over the anterior end of the body and reproduction was by multiple endogenous budding. Sand (1899) included the following three species in his genus; *H. brachyopoda* Stokes, 1885, *H. buckei* Kent, 1882 and *H. oviformis* Sand, 1899. Collin (1912) removed *H. buckei* to *Periacineta buckei* because of the presence of a lorica but little more was written about the genus until Corliss (1960) pointed out that the generic name was preoccupied. Finally Batisse (1975) erected the name *Brachyosoma* for *Hallezia* to include those species attached to the substratum only by means of a basal plate and established *Brachyosoma brachyopoda* Stokes, 1885 as the type species. Over the years several species have been described as being attached by simple basal body projections and these, for the first time, have been incorporated into the genus *Brachyosoma.*

Diagnosis of *Brachyosoma*

Freshwater or marine suctorians whose outline varies from oval to triangular. Lorica and stalk absent. Attached to animals or plants by means of a basal plate that is usually situated at

the end of a simple projection of the body. Tentacles may be arranged in one to four anterior fascicles or distributed over much of the anterior body surface. Actinophores sometimes present. Reproduction by endogenous budding. Macronucleus spherical to elongate.

Key to the species of *Brachyosoma*

1.	Freshwater, some epizooic on crustacea	2
	Marine, epizooic on crustacea . . . . . ***B. scottocalani***	
2.	Tentacles arranged in several fascicles	3
	Tentacles arranged in single fascicle or distributed all over body surface	4
3.	Epizooic on crustacea . . . . . ***B. bathynellae***	
	Not epizooic, attached to aquatic plants . . . . . ***B. brachypoda***	
4.	Tentacles with widened bases distributed over anterior body half . . . ***B. lycoperdon***	
	Tentacles in single anterior fascicle, without widened bases . . . . ***B. oviformis***	

Species descriptions

Brachyosoma brachypoda, Batisse, 1975

Podophrya brachypoda Stokes, 1885
Tokophrya brachipoda Butschli, 1889
Hallezia brachypoda Sand, 1899
Trichophrya melo Penard, 1920

DESCRIPTION (Fig. 25). This the type species, is a small (40–65 μm long), freshwater suctorian that is approximately spherical to pyramidal in shape. There are two to four fascicles of tentacles sometimes borne upon small rounded actinophores. The animal is attached to debris and fragments of aquatic plants by means of a basal plate that is situated at the end of a short, 5 μm long, posterior projection of the body. There is neither stalk nor lorica. Macronucleus spherical. Reproduction is by endogenous budding. The ciliated embryo is ovoid in shape and the single observation of its ciliation by Penard (1920) suggests that it has six, or possibly five, transversal rows of cilia.

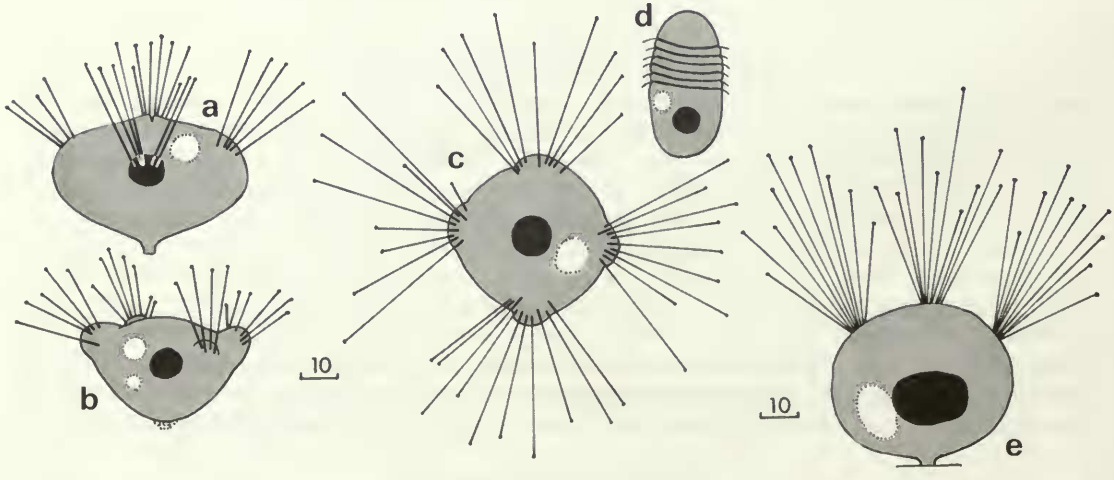

Fig. 25 *Brachyosoma brachypoda:* (a–d) after Penard, 1920 (called *Trichophrya melo*); (e) after Stokes, 1885 (called *Podophrya brachypoda*).

Brachyosoma bathynellae (Chappuis, 1944) n. comb.

Tokophrya bathynellae Chappuis, 1944

DESCRIPTION (Fig. 26). Small (15–25 μm long, freshwater epizooic suctorian whose shape is ovoid to irregular. It is approximately circular in cross section. There are usually three prominent actinophores which give it an irregular shape. Capitate tentacles in three fascicles. Attachment is by a simple basal plate that is situated at the end of a columnar extension of the body. Found attached to the syncarid crustacean *Bathynella* in subterranean lakes. Macronucleus spherical, with single adjacent contractile vacuole. Reproduction not described.

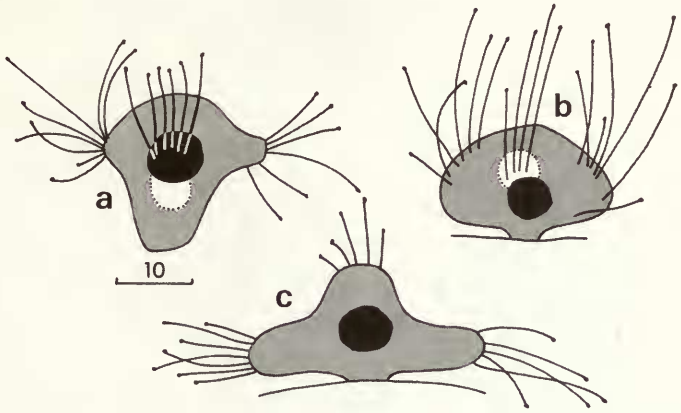

Fig. 26 *Brachyosoma bathynellae*, after Chappuis, 1944 (called *Tokophrya bathynellae*).

Brachyosoma lycoperdon (Penard, 1920) n. comb.

Trichophrya lycoperdon Penard, 1920
Muscophyra lycoperdon Jankowski, 1978

DESCRIPTION (Fig. 27). Small (22–35 μm long), freshwater, spherical suctorian whose dense pellicle is almost entirely covered with capitate tentacles. They are not arranged in fascicles but are limited to the anterior-most surfaces of the body. The tentacles are distinct in being quite wide at their bases and taper towards the tips giving the suctorian a rather 'prickly' appearance. Attachment is via a posterior projection of the body. Spherical macronucleus centrally located. Contractile vacuole in posterior body half. Reproduction not described. Found amongst detrital vegetation in lakes.

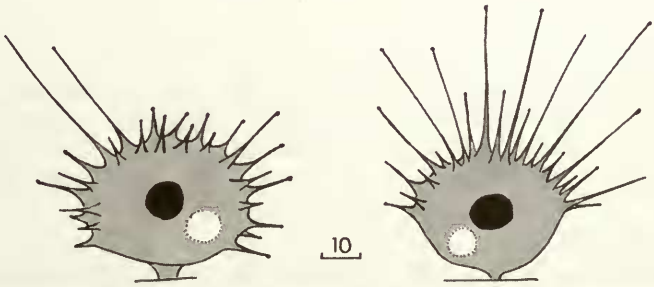

Fig. 27 *Brachyosoma lycoperdon*, after Penard, 1920 (called *Trichophrya lycoperdon*).

NOTE. Jankowski (1978) erected the genus *Muscophrya* for this species stating the major characteristic to be tentacles of the *Parapodophrya* type. Until more information becomes available this species has been transferred to *Brachyosoma* as the method of attachment is here considered to be of greater significance than the slightly different type of tentacles.

Brachyosoma oviformis (Sand, 1899) n. comb.

Hallezia oviformis Sand, 1899

DESCRIPTION (Fig. 28). Small (25–50 μm long), freshwater, ovoid suctorian with a single fascicle of capitate tentacles at the apex of the body. Attached by simple posterior body projection to aquatic plants. Neither lorica nor stalk present. Actinophores absent. Macronucleus spherical to ovoid. Contractile vacuole centrally located. Found amongst algae in rivers. Reproduction not described.

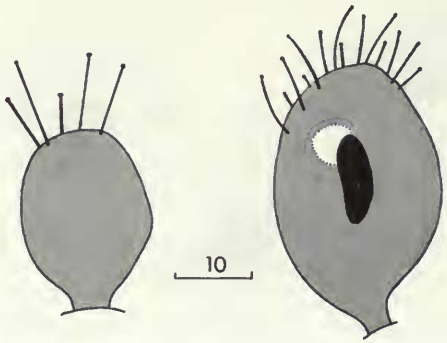

Fig. 28 *Brachyosoma oviformis*, after Sand, 1899 (called *Hallezia oviformis*).

Brachyosoma scottocalani (Sewell, 1951) n. comb.

Hallezia scottocalani Sewell, 1951

DESCRIPTION (Fig. 29). Small (10–31 μm long), marine, ovoid to pyriform suctorian. Two fascicles of capitate tentacles present situated either side of the body. Actinophores absent. Neither lorica nor stalk present. Attachment in young forms by flattened posterior region of body itself while older forms develop a body projection. Found attached to the copepod *Scottocalanus dauglishi* Sewell from the Gulf of Oman. Reproduction by endogenous bud formation. Macronucleus spherical, centrally located.

Genus ***ERASTOPHRYA*** Fauré-Fremiet, 1944

Until now *Erastophrya* has remained a single species genus, however, here another species *Trichophrya odontophora* Sand has been transferred into the genus because of its possession of some rather odd cytoplasmic extensions.

Diagnosis of *Erastophrya*

Freshwater or marine suctoria whose shape is pyriform, ovoid or irregularly so. Lorica and actinophores absent. Tentacles distributed all over body surface or restricted to anterior end. Posteriorly there are 2 or 3 cytoplasmic extensions that may be used as organelles of attachment. Reproduction by endogenous bud formation. Macronucleus ovoid, centrally located.

Key to species of *Erastophrya*

Freshwater, attached to peritrichs epizooic on fish, tentacles distributed all over body ***E. chattoni***
Marine, among algae, tentacles restricted to anterior half of body . . . ***E. odontophora***

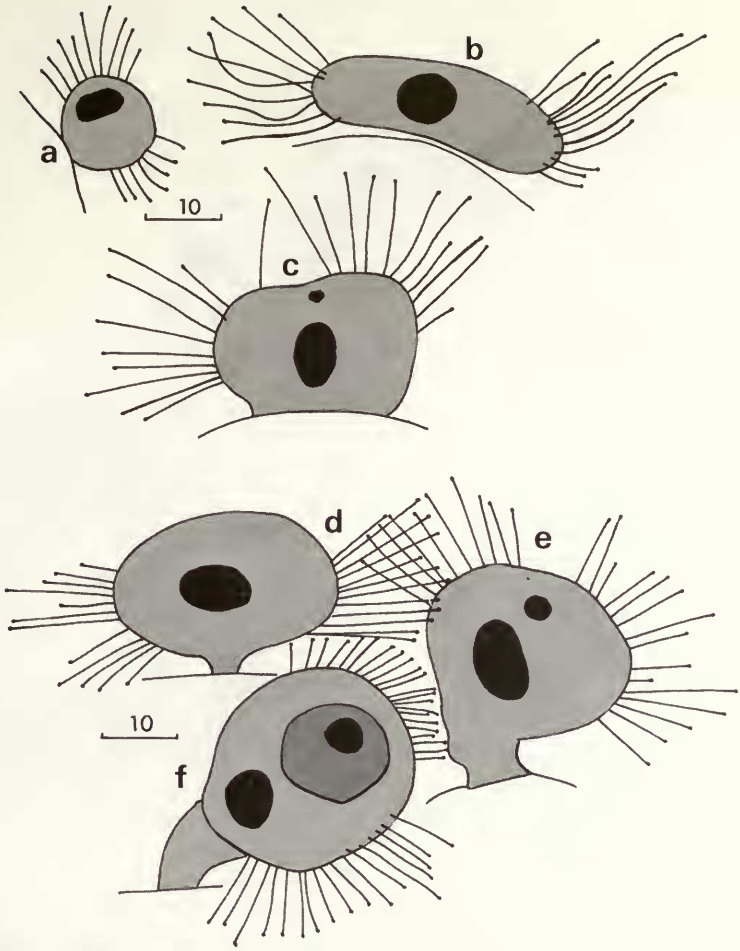

Fig. 29 *Brachyosoma scottocalani*: (a–f) after Sewell, 1951 (called *Hallezia scottocalani*).

Species descriptions

Erastophrya chattoni Fauré-Fremiet, 1944

DESCRIPTION (Fig. 30). This the type species is a medium to large (90–130 μm long), freshwater suctorian whose shape is pyriform to ovoid. Actinophores, lorica and stalk absent. There are a pair of posterior claspers that are used to grip the stalks of peritrichs such as *Apiosoma piscicola, A. campanulata* and *Rhabdostyla gasterostei* which are epizooic on freshwater fishes. Tentacles distributed all over body surface. Macronucleus ovoid, centrally located. Single lateral contractile vacuole. Reproduction by endogenous budding.

NOTE. There seems to be some disagreement on the description of the tentacles and body shape. Fauré-Fremiet (1944) and Matthes (1974) both illustrate (Fig. 28a) capitate tentacles well distributed over the pyriform body, but Banina (1973) and Jankowski (date not given) illustrate (Fig. 28b, c) (both taken from Banina, 1984) non-capitate tentacles and an ovoid body.

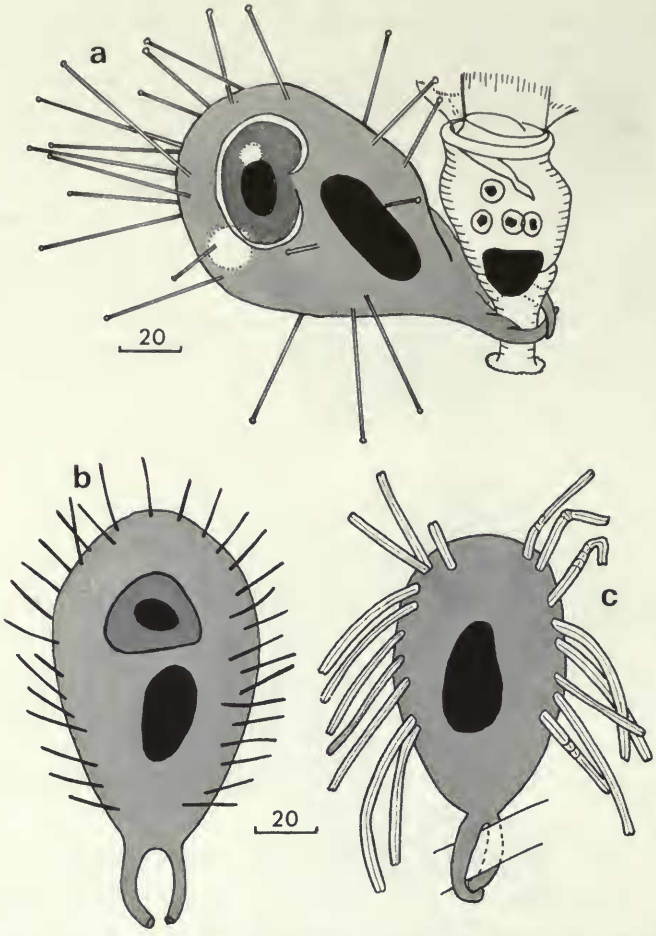

Fig. 30 *Erastophrya chattoni*: (a) after Fauré-Fremiet, 1944; (b) after Banina, 1973 *in* Banina, 1984; after Jankowski *in* Banina, 1984.

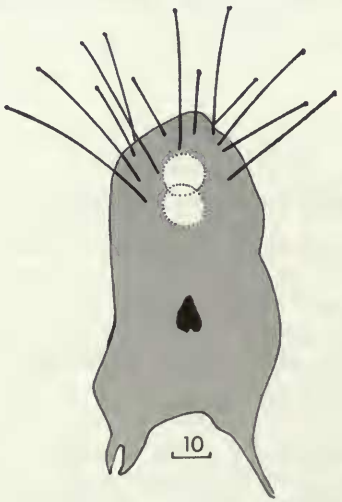

Fig. 31 *Erastophrya odontophora* after Sand, 1899 (called *Trichophrya odontophora*).

Erastophrya odontophora (Sand, 1899) n. comb.

Trichophora odontophora Sand, 1899

DESCRIPTION (Fig. 31). Medium (80–90 μm long), marine suctorian whose shape is irregularly ovoid. Actinophores, lorica and stalk absent. There are 3 posterior cytoplasmic extensions that may be used as organelles of attachment. Capitate tentacles restricted to anterior half of the body. Macronucleus centrally located. There are 2 contractile vacuoles located in the anterior body third. Found amongst marine algae. Reproduction not described.

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